[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2015-7290; Special Conditions No. 25-715-SC]

Special Conditions: Gulfstream Aerospace Corporation Model GVII-G500 Airplanes; Operation without Normal Electrical Power

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions; request for comments.

SUMMARY: These special conditions are issued for the Gulfstream Aerospace Corporation (Gulfstream) Model GVII-G500 airplane. This airplane will have a novel or unusual design feature when compared to the state of technology envisioned in the airworthiness standards for transport-category airplanes. This design feature is an electronic flight-control system, the functions of which are dependent upon the airplane's electrical power generation and distribution systems. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: This action is effective on Gulfstream on [**INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER**]. We must receive your comments by [**INSERT DATE 45 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER**].

ADDRESSES: Send comments identified by docket number FAA-2015-7290 using any of the following methods:

- s*Federal eRegulations Portal:* Go to http://www.regulations.gov/ and follow the online instructions for sending your comments electronically.
- a*Mail:* Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE., Room W12-140, West Building Ground Floor, Washington, DC, 20590-0001.
- *Hand Delivery or Courier:* Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- o*Fax:* Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to http://www.regulations.gov/, including any personal information the commenter provides. Using the search function of the docket Web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the **Federal Register** published on April 11, 2000 (65 FR 19477-19478), as well as at http://DocketsInfo.dot.gov/.

Docket: Background documents or comments received may be read at http://www.regulations.gov/ at any time. Follow the online instructions for accessing the docket or go to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey

Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Nazih Khaouly, FAA, Airplane and Flightcrew Interface Branch, ANM-111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98057-3356; telephone 425-227-2432; facsimile 425-227-1320.

SUPPLEMENTARY INFORMATION: The FAA has determined that notice of, and opportunity for prior public comment on, these special conditions is unnecessary because the substance of these special conditions has been subject to the public-comment process in several prior instances with no substantive comments received. The FAA therefore finds that good cause exists for making these special conditions effective upon publication in the Federal Register.

Comments Invited

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

We will consider all comments we receive by the closing date for comments. We may change these special conditions based on the comments we receive.

Background

On March 29, 2012, Gulfstream applied for a type certificate for their new Model GVII-G500 airplane. This transport-category, twin-engine airplane will be a business jet capable of accommodating up to 19 passengers. The maximum takeoff weight is 91,000 lbs.

Type Certification Basis

Under Title 14, Code of Federal Regulations (14 CFR) 21.17, Gulfstream must show that the Model GVII-G500 airplane meets the applicable provisions of 14 CFR part 25, as amended by Amendments 25-1 through 25-129.

If the Administrator finds that the applicable airworthiness regulations (i.e., part 25) do not contain adequate or appropriate safety standards for the Model GVII-G500 airplane because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same or similar novel or unusual design feature, the special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, Model GVII-G500 airplanes must comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34, and the noise-certification requirements of 14 CFR part 36. The FAA must issue a finding of regulatory adequacy under § 611 of Public Law 92-574, the "Noise Control Act of 1972."

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.17(a)(2).

Novel or Unusual Design Features

The Model GVII-G500 airplane will incorporate the following novel or unusual design feature:

An electronic flight-control system, the functions of which are dependent upon the electrical power-generation and distribution systems, whereby the loss of all electrical power may be catastrophic to the airplane. These special conditions retain the level of safety offered by 14 CFR 25.1351(d).

Discussion

The Gulfstream Aerospace Corporation Model GVII-G500 airplane incorporates a fly-by-wire flight-control system that requires a continuous source of electrical power to keep the flight-control system operable. The current regulation, § 25.1351(d), Amendment 25-72, "Operation without normal electrical power," states that the airplane must be operated safely in visual-flight-rules conditions for a period of not less than five minutes after loss of all normal electrical power. This rule was structured around a traditional design of mechanical control cables for flight control that allowed time for the crew to remedy an electrical failure, start the engine(s) if necessary, and re-establish some or all of the electrical power-generation capability.

To maintain the same level of safety associated with traditional designs, the Model GVII-G500 airplane design must not be time limited in its operation when the airplane is without its normal source of engine- or auxiliary-power-unit-generated electrical power. Service experience has shown that the loss of all electrical power generated by an airplane's engine generators or auxiliary power unit (APU) is not extremely improbable. Likewise, regulations require the applicant to demonstrate that the airplane has the power required for continued safe flight and landing with the use of its emergency electrical power systems. These emergency electrical power systems must be able to power all loads considered essential for continued safe flight and landing.

These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

Applicability

As discussed above, these special conditions are applicable to the Gulfstream Model GVII-G500 airplane. Should Gulfstream apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, these special conditions would apply to that model as well.

Conclusion

This action affects only a certain novel or unusual design feature on one model series of airplanes. It is not a rule of general applicability.

The substance of these special conditions has been subjected to the notice and comment period in several prior instances and has been derived without substantive change from those previously issued. It is unlikely that prior public comment would result in a significant change from the substance contained herein. Therefore, the FAA has determined that prior public notice and comment are unnecessary, and good cause exists for adopting these special conditions upon publication in the **Federal Register**.

The FAA is requesting comments to allow interested persons to submit views that may not have been submitted in response to the prior opportunities for comment described above.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

The Special Conditions

Because the total loss of normal, generated, electrical power in two-engine airplanes is not extremely improbable, and because the loss of all electrical power may be catastrophic to airplanes equipped with an electronic flight-control system, the following special conditions apply to Gulfstream Model GVII airplanes.

In lieu of § 25.1351(d), the following special conditions apply:

1. Gulfstream must show, by test or a combination of test and analysis, that the airplane is capable of continued safe flight and landing with all normal electrical power sources inoperative, as prescribed by paragraphs 1.a. and 1.b., below. For purposes of these special conditions, normal sources of electrical-power generation do not include alternate power sources such as the battery, ram-air turbine, or independent power systems such as the flight-control permanent-magnet generating system. In showing capability for continued safe flight and landing, Gulfstream must account for systems capability, effects on crew workload and operating conditions, and the physiological needs of the flightcrew and passengers for the longest diversion time for which Gulfstream is seeking approval.
    a. In showing compliance with this requirement, Gulfstream must account for common-cause failures, cascading failures, and zonal physical threats.
    b. Gulfstream may consider the ability to restore operation of portions of the electrical power generation and distribution system if it can be shown that unrecoverable loss of those portions of the system is extremely improbable. The design must provide an

alternative source of electrical power for the time required to restore the minimum electrical-power generation capability required for safe flight and landing. Gulfstream may exclude unrecoverable loss of all engines when showing compliance with this requirement.

2. Regardless of electrical-power generation and distribution-system recovery capability shown under special condition 1, above, sufficient electrical-system capability must be provided to:
    a. Allow time to descend, with all engines inoperative, at the speed that provides the best glide distance, from the maximum operating altitude to the top of the engine-restart envelope, and
    b. Subsequently allow multiple start attempts of the engines and auxiliary power unit (APU). The design must provide this capability in addition to the electrical capability required by existing part 25 requirements related to operation with all engines inoperative.
3. The airplane emergency electrical-power system must be designed to supply:
    a. Electrical power required for immediate safety, which must continue to operate without the need for crew action following the loss of the normal electrical power, for a duration sufficient to allow reconfiguration to provide a non-time-limited source of electrical power.
    b. Electrical power required for continued safe flight and landing for the maximum diversion time.

4. If the applicant uses APU-generated electrical power to satisfy the requirements of these special conditions, and if reaching a suitable runway for landing is beyond the capacity of the battery systems, then the APU must be able to be started under any foreseeable flight condition prior to the depletion of the battery, or the restoration of normal electrical power, whichever occurs first. Flight test must demonstrate this capability at the most critical condition.
    a. The applicant must show that the APU will provide adequate electrical power for continued safe flight and landing.
    b. The airplane flight manual (AFM) must incorporate abnormal procedures that direct the pilot to take appropriate actions to activate the APU after loss of normal engine-driven generated electrical power.
5. As part of showing compliance with these special conditions, the tests to demonstrate loss of all normal electrical power must also take into account the following:
    a. The assumption that the failure condition occurs during night instrument meteorological conditions (IMC) at the most critical phase of the flight, relative to the worst possible electrical-power distribution and equipment-loads-demand condition.
    b. After an unrestorable loss of normal engine-driven generated electrical power, the airplane engine-restart capability is provided and operations are continued in IMC.
    c. The airplane is demonstrated to be capable of continued safe flight and landing. The duration of this capability must be computed based on the maximum diversion-time capability for which the airplane is being certified. The applicant must account for airspeed reductions resulting from the associated failure or failures.

d. The airplane must provide adequate indication of loss of normal electrical power to direct the pilot to the abnormal procedures, and the AFM must incorporate abnormal procedures that will direct the pilot to take appropriate actions.

Issued in Renton, Washington, on January 11, 2018.

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Aircraft Certification Service
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